

### REMARKS

The Applicants would like to thank the Examiner for the quick and courteous Office Action. The Applicants have deleted the inadvertent use of the word "of" in the fourth line of paragraph [0021] on page 8 to correct this accidental error.

Claims 1, 3-5, and 7-13 are pending in the application. Claims 1-13 stand rejected. Claim 1 is amended. Claims 2 and 6 have been canceled. No new matter is added. Applicant respectfully requests reconsideration in view of the amendment and further in view of the following remarks.

#### Rejection Under 35 U.S.C. §102(b) over Pye

The Examiner has rejected claims 1 and 2 under 35 U.S.C. §102(b) as allegedly being anticipated by U.S. Pat. No. 3,709,300 to Pye.

The Examiner finds that Pye discloses a process of fracturing a subterranean formation wherein a first or initial spearhead fluid is injected to fracture the formation, wherein the first fluid includes a solid, particulate diverting agent which, in one embodiment, may comprise a solid dicarboxylic acid. The solid, particulate dicarboxylic acid diverting agent temporarily seals a portion of the fracture face, such that a second fluid or fracturing fluid containing propping agent is diverted deeper into the fracture and/or formation. Thus, intrusion of the second fluid into the near-wellbore portion of the formation penetrated by the fracture "is at least partially inhibited", as called for in claim 1.

The Applicants would respectfully traverse.

A patent claim is anticipated, and therefore invalid, only when a single prior art reference discloses each and every limitation of the claim. *Glaxo Inc. v. Novopharm Ltd.*, 52 F.3d 1043, 1047, 34 U.S.P.Q.2d 1565 (Fed. Cir.), *cert. denied*, 116 S.Ct. 516 (1995). The Examiner's attention is respectfully directed to the amendment to claim 1 herein where the solid, particulate dicarboxylic acid diverting agent is further described as *insoluble in both aqueous liquids* and hydrocarbon liquids, but is soluble in mutual solvents or alcohol blends. Support for this additional lan-

guage is found in claim 2 as originally filed (now canceled as redundant), and thus does not constitute an improper insertion of new matter. It is respectfully submitted that Pye does not teach or suggest methods using these diverting agents.

The Examiner's attention is respectfully directed to column 8, lines 27-43 of Pye, to which the Examiner also referred, which read:

Still other *water soluble* compositions that can be employed as fluid loss agents include organic compounds such as salts of fatty acids, amines, sulfonic acids and carboxylic acids; urea and substituted ureas; and aromatic *dicarboxylic* and *polycarboxylic acids*, particularly those having melting points above about 130°F. Representative organic *water-soluble*, oil-in-soluble fluid loss reducing agents comprise finely divided urea, paraformaldehyde, citric acid, ascorbic acid, butane tetra-carboxylic acid, dimethyl fumaric acid, heptane *dicarboxylic acid*, naphthalene *dicarboxylic acids*, phthalic acid, benzene sulfonic acid, toluene sulfonic acid, sulfamic acid, trimethylamine oxide and the dihydrochloride thereof, aniline hydrochloride, aniline picrate, acetamide, glycine hydrochloride, and pyridine hydrochloride. (Emphasis added.)

As can be seen, when Pye discusses dicarboxylic acids, he only teaches that they are water soluble fluid loss agents. In contrast, the claims now recite that the diverting agent is *insoluble* in both aqueous liquids and hydrocarbon liquids. The Applicant now respectfully submits that Pye does not and cannot teach or suggest the claimed method, as amended. There is no teaching or suggestion in Pye to use water insoluble dicarboxylic acid fluid loss agents. Because the single prior art reference does not teach each and every limitation of the claim, as amended, the patent claim is not anticipated. Reconsideration is respectfully requested.

#### Rejection Under 35 U.S.C. §103 over Pye

The Examiner rejected claims 3-6, 8-11, 13 and 14 under 35 U.S.C. §103(a) as allegedly being unpatentable over Pye for reasons of obviousness.

The Examiner notes that in carrying out the fracturing-diverting process of Pye, the particular operating ranges and diverting agent characteristics recited in claims 2-6, 8-11, and 13 are "deemed" by the Examiner to be obvious matter of

choice or design, based on routine experimentation for process optimization and/or the characteristics and properties of the oil formation actually encountered in the field. Moreover, the Examiner finds that Pye discloses their dicarboxylic acid component should preferably have a melting point greater than 130°F, and further include a mesh size of up to 50 microns. Also set forth is an exemplary concentration of the solid dicarboxylic acid in the first fluid of 8-150 pounds per 1,000 gals. Thus, the Examiner contends that to further refine or tailor such operating ranges to the particular subterranean formation under treatment would fall within the purview of one of ordinary skill in the art.

The Applicants would respectfully traverse.

To support an obviousness rejection, the Examiner has the initial burden of establishing a *prima facie* case of obviousness of the pending claims over the cited prior art, *In re Oeticker*, 977 F.2d 1443, 1445; 24 U.S.P.Q.2d 1443 (Fed. Cir. 1992). It is respectfully submitted that the Examiner has not met this initial burden.

Claims 3-6 depend from claim 1, which as noted previously has been amended to recite that the solid, particulate dicarboxylic acid diverting agent is further described as *insoluble* in both *aqueous* liquids and hydrocarbon liquids, but is soluble in mutual solvents or alcohol blends. Independent claims 8 and 13 already contain this language, and by reference and dependency, so do claims 9-11 and 14.

As established above, Pye does not teach or suggest solid, particulate dicarboxylic acid diverting agent that are *insoluble in aqueous liquids*. Instead and in contrast, as the Applicants pointed out in column 8, lines 27-43 of Pye, the only dicarboxylic acids taught therein are *water soluble* ones. These are not encompassed by the claims as amended herein, and Pye does not teach, suggest or hint that dicarboxylic acids *insoluble* in aqueous liquids are useful as fluid loss reducing agents therein. Thus, it is respectfully submitted, the subject rejection must fall because a *prima facie* case therefore has not been established. Reconsideration is respectfully requested.

Rejection Under 35 U.S.C. §102(b) over Knox

The Examiner has rejected claims 1 and 2 under 35 U.S.C. §102(b) as allegedly being anticipated by U.S. Pat. No. 3,374,835 to Knox.

The Examiner finds that Knox discloses the injection of an oil-based pre-flush fluid comprising a solid particulate dicarboxylic acid as a fluid loss or diverting agent, followed by a second treatment fluid, such as an acid, which is then diverted into a less permeable zone(s), as called for in claim 1.

As per claim 2, insofar as Knox employs myriad dicarboxylic acids, as set forth in column 3, lines 8-36, the Examiner "deems" that at least one or more of such dicarboxylic acids will inherently possess the recited solubility characteristics.

The Applicants must respectfully traverse.

Again, the Applicants would note *Glaxo Inc. v. Novopharm Ltd.*, *id.* which establishes that a patent claim is anticipated, and therefore invalid, only when a single prior art reference discloses each and every limitation of the claim. The Examiner's attention is once more respectfully directed to the amendments to claim 1 herein where the solid, particulate dicarboxylic acid diverting agent is further described as *insoluble* in both *aqueous liquids* and hydrocarbon liquids, but is soluble in mutual solvents or alcohol blends. It is respectfully submitted that Knox also does not teach or suggest methods using these diverting agents.

In the section of Knox noted by the Examiner, Knox refers to his fluid loss additives as "acid soluble". For Knox, this appears to be the same or nearly the same as being water soluble. The Examiner's attention is respectfully directed to column 2, lines 59-61: "A great variety of *acid and/or water soluble materials* can be utilized in the oil medium of the present invention." (Emphasis added.) The Examiner's attention is particularly directed to column 2, line 69 to column 3, line 36:

Another class of materials includes the lithium, potassium, calcium, magnesium and sodium salts and mixtures thereof of fatty acids, sulfonic acids and carboxylic acids, preferably those having a melt-

ing point greater than 100°C. Still another suitable material includes low molecular weight substituted organic acids and substituted polyalcohols. Particular examples of these materials are sugars, natural gums, starches, *water soluble* synthetic acrylic and acrylamide polymers, nylon (acid soluble), *water soluble* cellulose polymers (carboxymethyl cellulose), 2,4-dinitroacetic acid, ascorbic acid, carboxylic acid, benzene penta carboxylic acid, 3,3-biphenyl *dicarboxylic acid*, benzene sulfonic acids, (5-amino-2,4-dimethyl benzene sulfonic acid), 3-amino benzoic acid, 3,5-dinitrobenzoic acid, 3-hydroxy benzoic acid, 1,2,3,4-butane tetracarboxylic acid, 2-carboxy cinnamic acid, 2-carboxyphenyl acrylic acid, citric acid, heptane *dioic acid*, isocamphoric acid, 2,3-naphthalene *dicarboxylic acid*, 7-hydroxy naphthalene sulfonic acid, acetone *dicarboxylic acid*, phthalic acid (benzene *dicarboxylic*) ... (Emphasis added.)

It may be seen from these excerpts of Knox that the reference does not teach, suggest or hint that the claimed solid, particulate *dicarboxylic acids* are or should be *insoluble in aqueous liquids*. Clearly Knox's fluid loss additives may be not only acid soluble, but also water soluble. Because the single prior art reference does not disclose each and every limitation of the claim, as amended, the subject 35 U.S.C. §102(b) rejection must fall. Reconsideration is respectfully requested.

Rejection Under 35 U.S.C. §102(b) or 35 U.S.C. §103 over Knox

The Examiner has rejected claims 3-13 as allegedly anticipated by or, in the alternative under 35 U.S.C. §103(a) as allegedly obvious over Knox.

The Examiner finds that the particular operating ranges and diverting agent characteristics recited in claims 3-13 allegedly appear to be encompassed by the corresponding ranges and characteristics of Knox, e.g. note that Knox may employ a dicarboxylic acid diverting agent having a melting point "greater than 100°C" and the mesh size range in column 3. Alternatively, to operate the process of Knox within such operating ranges would have been an obvious matter of design choice or design, based on routine experimentation for process optimization and/or the characteristics and properties of the oil formation actually encountered in the field.

Similarly, the Examiner contends that the particular dicarboxylic acids recited in claim 7 appear encompassed, overall, by the myriad dicarboxylic acids set forth in column 3, lines 8-36. Alternatively, to choose a dodecanedioic acid, undecanedioic acid and/or decanedioic acid in lieu of the "heptane dioic acid" of Knox (col. 13, line 14) would allegedly have been an obvious matter of choice or design based on, e.g. relative availability and/or cost effectiveness, insofar as such similar dicarboxylic acids would be expected to exhibit similar characteristics and properties.

The Applicants must again respectfully traverse.

Again, to support an obviousness rejection, the Examiner has the initial burden of establishing a *prima facie* case of obviousness of the pending claims over the cited prior art, *In re Oeticker, id.* As previously established, Knox does not teach or suggest or hint that the diverting agent is "insoluble in both aqueous liquids and hydrocarbon liquids, but is soluble in mutual solvents or alcohol blends" as required by all of the pending claims. Consequently, the pending claims are not obvious therefrom.

It is additionally respectfully submitted that the Examiner may not appreciate the more critical or important group of diverting agents discovered by the Applicants to be particularly advantageous over the more general group of fluid loss additives taught by Pye and/or Knox. The Examiner's attention is particularly and respectfully directed to page 3, lines 5-29, paragraphs [0009]-[0011]:

**[0009]** It has been discovered that certain solid, particulate dicarboxylic acids provide excellent new diverting agents for acidizing stimulation of subterranean formations. These diverting agents are also called diversion agents or displacement agents. These new acid diverting agents include, in one non-limiting embodiment, dicarboxylic acids with formula molecular weights of from 146 to 400, inclusive, or a mixture of them. Alternatively, the dicarboxylic acids have formula molecular weights of from 160 to 230.

**[0010]** These acid diverting agents are preferably compatible with acids conventionally used in acidizing treatments including, but not necessarily limited to hydrochloric acid, formic acid, acetic acid, long-

chained (e.g. C<sub>5</sub> – C<sub>8</sub>) organic acids, and mixtures thereof with hydrofluoric acid, or aminocarboxylic acids and their derivatives. The acid diverting agents of this invention are also expected to be compatible with most acid additives, including but not necessarily limited to, iron control agents, non-emulsifiers, corrosion inhibitors, and mutual solvents.

**[0011]** *It is important that the solid dicarboxylic acids are insoluble in both aqueous and hydrocarbon liquids, but are highly soluble in regular mutual solvents or alcohol blends, which are usually added into the acid fluid to increase penetration.* In the context of this invention, "insoluble" is defined as a solubility of less than 0.1 wt.% in the liquid of interest at room temperature of 70°F (21°C). Mutual solvents are defined herein as volatile solvents that are miscible with more than one class of liquids. In particular, mutual solvents may be understood as chemical additives for use in stimulation treatments that are soluble in oil, water and acid-based treatment fluids. They are routinely used in a range of applications, such as removing heavy hydrocarbon deposits, controlling the wettability of contact surfaces before, during and/or after a treatment, and preventing or breaking emulsions. (Emphasis added.)

As noted, Knox does not hint or suggest the use of fluid loss additives that are insoluble in both aqueous and hydrocarbon liquids, but soluble in mutual solvents or alcohol blends. These characteristics give more control over the flow diverting methods claimed, and are not supposed or imagined by Knox.

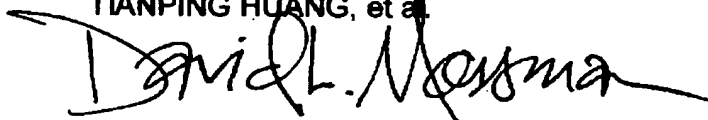
The Applicant further notes that pimelic acid (1,7-heptanedioic acid) is slightly soluble in water whereas dodecanedioic acid, undecanedioic acid and decanedioic acid are not. Thus, choosing the former in lieu of one of the latter would *not* have been a matter of obvious design choice, but instead would be outside the scope of the claims.

For all of these reasons, it is respectfully submitted that the Examiner has not made a *prima facie* case of obviousness of claims 3-13 over Knox, and the rejection must fall. Reconsideration is respectfully requested.

It is respectfully submitted that the amendments and arguments presented above overcome all of the rejections. Reconsideration and allowance of the claims are respectfully requested. The Examiner is respectfully reminded of his duty to indicate allowable subject matter. The Examiner is invited to call the Applicants'

attorney at the number below for any reason, especially any reason that may help advance the prosecution.

Respectfully submitted,  
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